



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/872,892	06/01/2001	Hung-Hsiang Jonathan Chao	Poly-19/APP	3157
26479	7590	10/07/2005	EXAMINER	
STRAUB & POKOTYLO 620 TINTON AVENUE BLDG. B, 2ND FLOOR TINTON FALLS, NJ 07724			PHAN, MAN U	
			ART UNIT	PAPER NUMBER
			2665	

DATE MAILED: 10/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/872,892	<b>Applicant(s)</b> CHAO ET AL.	
	<b>Examiner</b> Man Phan	<b>Art Unit</b> 2665	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 July 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,8-14,16 and 18-37 is/are rejected.
- 7) ☒ Claim(s) 2-7,15 and 17 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Response to Amendment and Argument***

1. This communication is in response to applicant's 07/11/2005 Amendment in the application of Chao et al. for a "Scheduling the dispatch of cells in multistage switches using a hierarchical arbitration scheme for matching non-empty virtual output queues of a module with outgoing links of the module". This application claims Priority from Provisional Application 60/252,006 filed 11/20/2000 and 60/253,335 filed 11/27/2000. The proposed amendment to the claims and response have been entered and made of record. Claim 1 has been amended. Therefore, examiner has withdrawn the 35 USC 112 of record to claim 1. Claims 1-37 are pending in the present application.

2. Applicant's amendment and argument to the rejected claims are insufficient to distinguish the claimed invention from the cited prior arts or overcome the rejection of said claims under 35 U.S.C. 103 as discussed below. Applicant's argument with respect to the pending claims have been fully considered, but they are not persuasive for at least the following reasons:

3. In response to Applicant's argument that there is no suggestion to combine the references, i.e., Hughes et al. and Angle et al. as proposed in the office action. The Examiner recognizes that references cannot be arbitrarily combined and that there must be some reason why one skilled in the art would be motivated to make the proposed combination of primary and secondary references. *In re Nomiya*, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for

Art Unit: 2665

combining references is what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. *In re McLaughlin*, 170 USPQ 209 (CCPA 1971). It must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. *In re McLaughlin*, 443, F.2d 1392; 170 USPQ 209 (CCPA 1971). In this case, Hughes et al. are applied herein merely for the teaching of a multi stage switching including schedule service of cells or packets buffered at the input ports of a switch (See Fig. 2). An apparatus is described comprising an ingress port, a plurality of switch planes having a dedicated scheduler, each of the switch planes communicatively coupled to the ingress port. Also, a method is described comprising queuing traffic at an ingress port, requesting switch plane service for the traffic across a plurality of switch planes, and scheduling the traffic independently at each of the switch planes (Col. 1, lines 47 plus). Typically, the multi-stage switch is a time-space-time (TST) switch having three stages: an input time switch (input stage), a space switch stage (middle stage), and an output switch stage (output stage). Each time switch in the input time stage is coupled to multiple space switches. The space switches are coupled to the output time switches. The output of each space switch can be directed to a single port, or, alternatively, broadcast to any number of output ports. In the conventional multi stage ATM switch. The first stage has  $n \times m$  switches, the second stage has  $m \times n$  switches, and the third stage has  $n \times m \times n$  switches. Conventionally, it has been known that a cross architecture in which three stages of basic switches are connected is effective for expanding the switch size. In the same field of endeavor,

Art Unit: 2665

Angle et al. discloses a method and apparatus are provided for scheduling unicast and multicast data in an input-queued network device. According to one aspect of the present invention, a combined schedule is created by pipelined staging of multicast and unicast scheduling. Multicast cells are scheduled for transmission among multiple interfaces of a crossbar by performing a multicast cell scheduling cycle for multiple classes of service that are supported by the network device. Then, unicast cells are scheduled for transmission among the interfaces at a lower priority than the previously scheduled multicast cells by performing a unicast cell scheduling cycle for the multiple classes of service using only those interfaces that remain unmatched after completion of the multicast cell scheduling cycle (Fig. 1; Col. 2, lines 20 plus).

4. Claims 1-37 of this application conflict with claims 1-34 of Co-pending Application 09/911,038 (Pub No. 2003/0021266), and claims 1-35 of Co-Application No. 09/851,461 (Pub No. 2002/0061020). 37 CFR 1.78(b) provides that when two or more applications filed by the same applicant contain conflicting claims, elimination of such claims from all but one application may be required in the absence of good and sufficient reason for their retention during pendency in more than one application. Applicant is required to either cancel the conflicting claims from all but one application or maintain a clear line of demarcation between the applications. See MPEP. 822.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 8-14, 16, 18-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hughes et al. (US#6,747,971) in view of Angle et al. (US#6,477,169).

With respect to claims 16, 27 and 28, 37, Hughes teaches a combination for use in a multi-stage switch, the combination comprising: a) a plurality of central modules (Fig. 3, modules 309a-309h), each including outgoing links towards output modules (egress ports 306a-

Art Unit: 2665

306n) including a plurality of output ports (ports 1-14), b) a plurality of input modules (ingress pods 304a-304n), each including individual output queues (312a-312n and 313), and ii) outgoing links coupled with each of the plurality of central modules (shown as lines between ingress ports and 309). Hughes also teaches k input modules (Fig. 3, 304a- 304n), each having n input ports (312a-312n plus 313),  $n \times k$  virtual output queues (312a-312n, 313  $\times$  304a-304n), and m outgoing links (315a-315h);  $n \times k$  virtual output queues of each input module are grouped into k groups (304) of n virtual output queues (312 plus 313), and c) means for matching a non-empty virtual output queue of the input module with an outgoing link in the input module (col. 6, lines 64-67 and col. 7, lines 1-4); and d) means for matching the outgoing link of the input module with an outgoing link of one of the central modules (col. 6, lines 10-15).

Hughes does not expressly disclose master arbiters and groups of slave arbiters associated with outgoing links and k group of n virtual output queues respectively. However, Hughes teaches the matching of non-empty virtual output queue includes means for broadcasting (col. 3, lines 66-67 and col. 4, lines 1-2) a request for the non-empty virtual output queue to an arbiter (Fig. 3, request controller 314) for each of the outgoing links of the input module (col. 6, lines 41-44); ii) for each of the outgoing links of the input module, an arbiter for selecting a non-empty virtual output queue that broadcast a request (col. 4, lines 24-26 ; iii) means for sending a grant to an arbiter for the selected non-empty virtual output queue (col. 4, lines 26-28), and iv) for the selected non-empty virtual output queue, an arbiter for selecting an outgoing link from among the one or more outgoing links that sent a grant (col. 4, lines 28-30). In the same field of endeavor, Angle et al. (US#6,477,169) discloses a method and apparatus for scheduling unicast and multicast data in an input-queued network device (Figs. 1, 5 & 8), in which the active

Art Unit: 2665

request vector registers 540 are coupled to the output grant arbiters 550. Each of the output grant arbiters 550 are presented with priorities and a request vector from the active request vector registers 540. For example, output grant arbiter 0 receives request vector 541 which indicates which of the input ports have a request for output port 0 and identifies the priorities associated with each of the requests. Similarly, output grant arbiters 1 and N receive request vectors 542 and 543, respectively and the associated priorities. Each output grant arbiter 550 looks at the inputs associated with the class of service selected for the current iteration and selects one request on behalf of the corresponding output port. According to one embodiment, the output grant arbiters 550 select the request closest in priority to the GRRC in a circular fashion. A vector identifying the selected and non-selected input ports is then stored in the grant vector registers 570. Once an output grant arbiter 550 has matched an input port to its corresponding output port, it is disabled in all further iterations of the multicast scheduling cycle in order to prevent the output grant arbiter 550 from making additional matches (Col. 10, lines 25 plus).

Regarding claims 18, 25 and 29, 36, Hughes teaches means for matching a non- empty virtual output queue of an input module with an outgoing link in the input module performs the match within one cell time slot (Col. 6, lines 27-33, 54-58 and 63-67).

Regarding claims 19, 21, 23 and 30, 32, 34, Hughes teaches the arbiter of each of the outgoing links operates in accordance with a round robin discipline through each of the virtual output queues of the input module (col. 3, lines 44-47 and Col. 18, lines 3-10).

Regarding claims 20, 22, 24 and 31, 33, 35, Hughes teaches the arbiters operates independent of the others (Col. 3, lines 37-43).

Regarding claim 26, Hughes teaches the means for matching the outgoing link with an



Art Unit: 2665

outgoing link of one of the central modules include: i) means for sending a request for the outgoing link of the input module to an arbiter for each of the outgoing links of the central modules that lead towards an output port associated with the virtual output queue matched with the outgoing link of the input module (Col. 7, lines 16-24), and ii) for each of the outgoing links of the central module, an arbiter for selecting an outgoing link of the input module that sent a request (Col. 8, lines 10-12).

Regarding claims 1, 8-14, they are method claims corresponding to the apparatus claims 16, 18-37 above. Therefore, claims 1, 8-14 are analyzed and rejected as previously discussed with respect to claims 16, 18-37.

One skilled in the art would have recognized the need for effectively and efficiently scheduling packets buffered at input ports of a multi stage switch in telecommunication network, and would have applied Angle's novel use of the arbiters in scheduling port connection into Hughes's teaching of multi stage switch employs input buffering architectures. Therefore, It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to apply Angle's multicast and unicast scheduling for a network device into Hughes' crosspoint switch with independent schedulers with the motivation being to provide a method and apparatus for scheduling the service of cells or packet buffered at input ports of a switch.

***Allowable Subject Matter***

8. Claims 2-7 and 15, 17 are objected to as being dependent upon the rejected base claims, but would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

9. The following is an examiner's statement of reasons for the indication of allowable subject matter: The closest prior art of record fails to disclose or suggest the steps of means for sending on behalf of each non-empty virtual output queue, a request to slave arbiters, each of the slave arbiters being associated with one of the outgoing links of the input module, and each of the slave arbiters being associated with one of the groups of virtual output queues; and means for sending, on behalf of each of the groups of virtual output queues to which a non-empty virtual output queue belongs, a request to master arbiters, each of the master arbiters being associated with one of the outgoing links of the input module, as specifically recited in claims 2 and 15, 17.

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Art Unit: 2665

Oki et al. (US#6,940,851) discloses a scheduling the dispatch of cells in non-empty virtual output queues of multistage switches using a pipelined arbitration scheme.

Oki et al. (US#2002/0181483) discloses a pipelined maximal-sized matching cell dispatch scheduling.

Nichols et al. (US#6,473,428) discloses a multi threaded, multi cast switch.

Yasukawa et al. (US#2005/0053096) discloses an ATM switch.

Yasukawa et al. (US#2005/0083939) discloses an ATM switch.

Krishna et al. (US#6,563,837) discloses a method and apparatus for providing work conserving properties in a non-blocking switch with limited speedup independent of switch size.

Dally et al. (US#6,285,679) discloses a method and apparatus for event driven routing.

Golla et al. (US#2002/0176431) discloses a multiserver scheduling system and method for a fast switching element.

Golla et al. (US#2003/0007498) discloses a multicast and unicast scheduling for a network device.

12. **THIS ACTION THIS ACTION IS MADE FINAL.** See MPEP ' 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR

Art Unit: 2665

1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

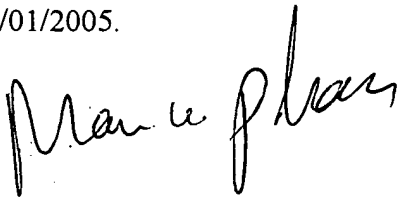
13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Phan whose telephone number is (571) 272-3149.

The examiner can normally be reached on Mon - Fri from 6:00 to 3:00 EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu, can be reached on (571) 272-3155. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at toll free 1-866-217-9197.

Mphan

10/01/2005.

A handwritten signature in black ink, appearing to read 'Man U. Phan', written in a cursive style.

**MAN U. PHAN  
PRIMARY EXAMINER**